Timing-Inferential Unitary Pulse Harmonic Data Transmission System for Reliable RF Communications in Electromagnetically Contested Environments

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Introduction

Two previous publications include concepts which, when combined, would be highly conducive to the goal of creating jamming-proof communication links with drones and other remote terminals. The first of these is “12 September 2023,” in which the concept of gating signals on the basis of complex harmonics using metamaterials was proposed. The second of these was “21 October 2025” in which a mechanism is described which is capable of solitonizing waves of electromagnetism according to their phase height using spheres, which can be magnetized in order to alter the frequency at which the spheres will solitonize an EM wave.

Although the concept of requiring a harmonic remains a goal, the idea of using meta-materials to act as the gating mechanism is likely not feasible because of the fixed nature of the materials and their tendency to convert other frequencies into current aside from the target frequency. To resist jamming, there must be an ability to tightly control the accepted frequency and to change the accepted frequency with great rapidity.

The combined “filter and antenna” concept of 21 October 2025 using metallic spheroids linked to electromagnets to transmogrify the solitonization effect of the spheroids upon EM can provide the basis of a highly jamming-resistant system when combined with the 2023 concept of requiring coordinated, time-sensitive harmonics in order to convey information.

Abstract

I propose that a series of the ferromagnetic spheroids described in the 21 October 2025 publication (ibid.) form the basis of a signal gating mechanism. The spheres would solitonize received RF if its frequency conforms to the solitonization characteristics of the sphere, which could be modified by applying a magnetic field of varying strength to each of a series of spheres of known size. The ability to apply a magnetic field would act as a fine-tuning knob which adjusts which frequency of EM which, when it interacts with the spheres, generates a soliton wave which eventually is converted into current.

The electricity-generating mechanisms themselves, rather than being conventional antennae, would be piezo-electric in nature and would generate electricity in response to physical forces exerted by the soliton waves. Only when EM waves are solitonized i.e. only when their phase height matches the diameters of the spheres (or the adjusted effective solitonization diameter as titrated by the magnetic fields) would solitonization be achieved.

Each receiver would consist of perhaps 100 or more of these small spheroid solitonizers, which would fit into an EM-blocking metamaterial layer to reduce

harmful interference. The spheroids would half-protrude from this layer in a manner akin to a golf ball which has struck an automotive windshield but failed to entirely penetrate the glass and has therefore become wedged into the material. Any RF which makes it through in its conventional form would have little effect upon the function of the device as the device would accept as valid only solitonized signals. However, the EM-blocking materials would ensure that other components such as wiring do not absorb disruptive amounts of EM from the jamming signals.

One shortcoming of conventional antennae is that no matter how sophisticated the signal processor used to remove noise, antennae can easily be overwhelmed by jammers because of the simple fact that electricity conducted by a conventional antenna moves at about 10% of the speed of light and the jamming signal, which is being converted into electrons, is able to move at 100% of the speed of light, leading to an accumulation of electricity which prevents photoelectric conversion. A saturated antenna becomes negatively charged and unable to convert legitimate signals into electrons.

This proposal is going to overcome that problem as the solitonizing sphere and the piezo-electric current generator backing it will function in the same way regardless of jamming.

As each piezo-electric current generator would be dedicated to only one allowed frequency, it would be highly unlikely to be overwhelmed by the intermittent jamming signals which happen to match the accepted frequency at any given time by coincidence.

This system would operate according to a logic which is quite different from standard data transmission.

The logic of the system is as follows:

Rather than the use of frequency modulation, amplitude modulation or, even, pulse modulation for binary data transmission, this system would convey data according to not binary, but unitary pulses. In and of itself, a unitary pulse would ordinarily not be able to convey any information.

In order for a unitary pulse to register in this proposed system, a harmonic of eight, specific, accepted frequencies which constantly change in a way which is impossible for an adversary to predict, but which is mutually known to sender and receiver must be simultaneously emitted. This is made possible by an onboard precision chronometer which is time-synchronized with the sender’s precision chronometer.

Precision chronometers indicate the time down to a precision which is represented by upwards of 18 decimal places. In the last nine digits of a time code with 18 digits, more than 24 binary bits of data could be represented simply by ensuring that a unitary pulse is emitted at a time which corresponds to, for example, a color value of a pixel which a drone might wish to relay to a drone operator. If one wishes to transmit the details of an image in which each pixel can have one of 16.7 million color values, then an opportunity to convey the correct color information would come around like a carousel once

every 16.7 million femtoseconds, assuming the clocks are operating and synchronized to a precision of +/- 1 femtosecond. That would amount to the ability to transmit robust amounts of data of about 59 Megapixels of uncompressed image data per second. A reduced color palette would allow for reduced requirements for bandwidth.

In order to prevent jamming, the magnetic fields applied to the spheroids would have to be adjusted, at minimum, thousands of times per second. The adjustments applied would determine which specific frequencies would be accepted. Only when the correct combination of eight pathways are electrified by the piezo-electric mechanism would a unitary pulse be recorded. The intended contents of the unitary data packet of would be *inferred* by the precise time at which the instruction was received.

In order to ensure that both sender and receiver are using the same system for predicting the next valid harmonic, both the sending and receiving radios would be programmed with a starting encryption key which changes before each drone flight. An SHA-2 (HMAC-) based recursive hashing function would be used to permute the starting key in a manner which is both pseudo-random and unknowable to an adversary without knowledge of the starting key and the permutative HMAC key.

A drone controller might wish only to send simple instructions such as "increase altitude," "move left," "move right," "return to base," "detonate," et cetera. This would be readily supported as these commands would require significantly less bandwidth and would be interpreted according to the same chronometer-referencing system. For example, if the time code ends in "1", that would be interpreted as a command to increase altitude. If a unitary pulse is received when a time code ends in a "2," this might be interpreted as an instruction to move to the left, et cetera.

Because of the advanced filtering mechanism used, the actual mechanism which converts signals into current cannot be overwhelmed through electron loading into the antenna. Drones controlled according to this communication protocol cannot be hijacked or interfered with using RF jamming because there would be no way to correctly guess the needed harmonic and as the precision chronometers enable for robust data transmission using unitary pulses predicated upon both a shared knowledge of the current time as well as which harmonic will be accepted by the system at any given time.

Conclusion

As this system would be both highly resistant to jamming and cheap to manufacture, I recommend that it be implemented immediately wherever jamming-resistant radio-based communications are required.